PTO-1390 (Modified) 11-2000) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

531 Rec'd PCT/PTO 07 JAN 2002

ATTORNEY'S DOCKET NUMBER	U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR
112740-389	10/030590

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/DE00/01491	12 May 2000	07 July 1999

TITLE OF INVENTION
METHOD AND APPARATUS FOR CORRECTING A USEFUL SIGNAL FALSIFICATION

APPLICANT(S) FOR DO/EO/US
Ulrich Gretzer et al.

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include itens (5), (6), (9) and (24) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
   a. ☒ is attached hereto (required only if not communicated by the International Bureau).
   b. ☐ has been communicated by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. ☒ is attached hereto.
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
   a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   b. ☐ have been communicated by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☒ A copy of the International Search Report (PCT/ISA/210).

Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☒ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
20. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
21. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
22. ☒ Certificate of Mailing by Express Mail
23. ☐ Other items or information:

APPLICATION NO. (IF KNOWN, SEE 37 CFR)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
10/030590	PCT/DE00/01491	112740-389

24. The following fees are submitted:.

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

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CALCULATIONS PTO USE ONLY

☐	Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO	**$1040.00**
☒	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO	**$890.00**
☐	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO	**$740.00**
☐	International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4)	**$710.00**
☐	International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4)	**$100.00**

ENTER APPROPRIATE BASIC FEE AMOUNT =	**$890.00**	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).	**$0.00**	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	13 - 20 =	0	x $18.00	**$0.00**	
Independent claims	2 - 3 =	0	x $84.00	**$0.00**	
Multiple Dependent Claims **(check if applicable).**			☐	**$0.00**	
TOTAL OF ABOVE CALCULATIONS =				**$890.00**	
☐ Applicant claims small entity status. See 37 CFR 1.27). The fees indicated above are reduced by 1/2.				**$0.00**	
SUBTOTAL =				**$890.00**	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). +				**$0.00**	
TOTAL NATIONAL FEE =				**$890.00**	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) **(check if applicable).** ☐				**$0.00**	
TOTAL FEES ENCLOSED =				**$890.00**	
				Amount to be: refunded	$
				charged	$

a. ☒ A check in the amount of **$890.00** to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. **02-1818** A duplicate copy of this sheet is enclosed.

d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

William E. Vaughan (Reg. No. 39,056)
Bell, Boyd & Lloyd LLC
P.O. Box 1135
Chicago, Illinois 60690-1135

SIGNATURE

William E. Vaughan
NAME

39,056
REGISTRATION NUMBER

January 7, 2002
DATE

BOX PCT

IN THE UNITED STATES ELECTED/DESIGNATED OFFICE
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY-CHAPTER II

PRELIMINARY AMENDMENT

APPLICANTS:	Ulrich Gretzer et al.	DOCKET NO.:	112740-389
SERIAL NO:		GROUP ART UNIT:	
FILED:		EXAMINER:	
INTERNATIONAL APPLICATION NO::		PCT/DE00/01491	
INTERNATIONAL FILING DATE		12 May 2000	
INVENTION:	METHOD AND APPARATUS FOR CORRECTING A USEFUL SIGNAL FALSIFICATION		

Assistant Commissioner for Patents,
Washington, D.C. 20231

Sir:

Please amend the above-identified International Application before entry into the National stage before the U.S. Patent and Trademark Office under 35 U.S.C. §371 as follows:

In the Specification:

Please replace the Specification of the present application, including the Abstract, with the following Substitute Specification:

SPECIFICATION

TITLE OF THE INVENTION

METHOD AND APPARATUS FOR CORRECTING
A USEFUL SIGNAL FALSIFICATION

BACKGROUND OF THE INVENTION

The present invention relates to a method for correcting a useful signal falsification in the receiver part of a telecommunication transmission system which operates, in particular, according to the TDD or TDMA method, and to a device for carrying out this method.

In mobile radio systems, multiple access methods or multiplex methods are absolutely necessary owing to the limited resources of the frequency spectrum in order to make possible subscriber numbers of orders of magnitude ranging from millions to hundreds of millions. The method of access of a number of subscribers must be organized and the receiver parts must be embodied in such a way that an unacceptable interference of the transmission of information does not occur.

The frequency, time-division and code multiplex methods are known as basic multiple access methods, and all three methods are used in practice in mobile telephone networks. Specifically, time-division multiplex methods, which are implemented in practice as TDD (Time Division Duplex) or TDMA (Time Division Multiple Access) have become very widespread in digital mobile telephone networks, in which they are often combined with frequency-division multiplex methods (FDMA = Frequency Division Multiple Access) in such a way that a number of carrier frequencies are provided. Thus, according to the GSM standard, carrier frequencies with 200 kHz spacing with respect to one another are provided and a subdivision into eight time slots on each carrier frequency is predefined.

Time-division multiplex techniques are also being increasingly used for cordless telephones, a combination of FDMA and TDMA also being provided here. In the European DECT standard for cordless telephones, up to ten frequency channels are used, which are each divided into twelve time slots for the uplink and downlink.

The receivers in TDD or TDMA systems can be built according to the direct conversion principle. In such receivers, adjacent channel sources of interference result in square wave interference owing to quadratic elements which are produced in the analog part of the receiver, in particular in the reception mixer, the square wave interference bringing about an increase in the bit error rate during the customary digital modulation. In order to fulfill the stringent requirements in terms of the bit error rate which are made of system protocols, in particular of the GSM system, very high demands are made of the transmission qualities of the mixer, which demands cannot currently be fulfilled with established circuit technologies.

For this reason, it has been proposed to correct the aforesaid interference subsequently via iterative, computational determination of the change in the signal amplitude (offset) associated with the interference, via a correction device which is

connected downstream of the mixer. However, this entails a high degree of computational complexity and a correspondingly increased level of current consumption and, therefore, reduces the possible maximum call duration which constitutes an essential performance parameter of any mobile telephone.

The present invention is, therefore. directed toward an improved method of the genus-forming type, which avoids computational complexity and saves current, as well as an apparatus for carrying out this method.

SUMMARY OF THE INVENTION

The present invention includes the essential idea of firstly determining the time when interference starts and subsequently, via this knowledge, carrying out a correction process in a way that is less complex and, thus, saves current with regard to the calculation processes. By applying an analog correction method, there is virtually no added computational complexity (in the narrowest sense) here.

In one preferred embodiment, differentiation of the composite signal and then threshold value discrimination of the first deviation is carried out with a predetermined threshold value in order to determine the time when the interference starts. This threshold value corresponds to the maximum possible steepness of the useful signal, multiplied by a suitably selected safety factor in order to avoid incorrect detection. Both the formation of the first deviation of the composite signal and its comparison with the aforesaid threshold value constitute routine operations which can be implemented readily, and with relatively low power consumption, using integrated circuit technology and/or via suitable software – within the framework of complex digital signal processing (DSP) which is implemented in any case.

However, as an alternative, it is also possible to provide, for the determination of the point in time when interference starts, a specific detector element (for example, a detector diode) or a circuit with a corresponding function (for example, what is referred to as an RSSI circuit) which utilizes, in particular, the frequency offset of the source of interference with respect to the carrier signal.

The actual correction process which is carried out using the information relating to the time when the interference starts can be configured as a calculation process on the basis of digitized values of the signal amplitude or, alternatively, as an analog "subtraction."

In the former case, in particular a (digital) average value formation of the composite signal is carried out in the period between the rising edge of the useful signal up to the starting time of the interference on the one hand, and in the period from the starting time of the interference up to the trailing edge of the useful signal on the other hand, and the two calculated average values are subsequently subtracted. It is also possible to determine the interference signal energy during the detection of the source of interference and to subtract it from the composite signal energy starting from the time when the interference starts. In this later case, subtraction is also possible in the sense of a genuine calculation after the corresponding energy values have been digitized.

In an apparatus for carrying out the method according to the present invention, corresponding to the above-mentioned characterization of the method according to the present invention, sensing parts for determining the time when the interference starts and correction parts which are connected at the input end to these sensing parts in order to carry out the offset correction are provided. Reference has already been made above to embodiment possibilities for the sensing parts. If a detector element or a detector circuit is used, in particular a correction stage for taking into account the detector characteristic curve for the output signal shape and/or a pulse shaper stage is connected downstream of it. In an analog embodiment, the actual correction parts can have an analog subtraction device; in the case of a digital calculation of the absolute offset value or correction value, a reference value memory and a digital subtraction stage, and in particular an average value calculation stage connected upstream of these units, are provided.

Additional features and advantages of the present invention are described in, and will be apparent from, the following Detailed Description of the Invention and the Figures.

BRIEF DESCRIPTION OF THE FIGURES

Figs 1a and 1b are exemplary views of the time-dependence of the useful signal and interference signal and/or of a composite signal of a real mixer in a direct conversion receiver.

Fig. 2 is a schematic view of a first embodiment in the form of a block diagram.

Fig. 3 is a schematic view of a second embodiment in the form of a block diagram.

Fig. 4 is a schematic view of a third embodiment in the form of a block diagram.

Fig. 5 is a schematic view of a fourth embodiment in the form of a block diagram.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 1a shows the time profile of a useful signal with a carrier frequency f1 and a level P1, and in a separate illustration the time profile of an interference signal with a carrier frequency f2 and a level P2, such as would occur in an ideal reception mixer. The starting time (the rising edge) of a useful signal pulse is designated by t_A, and its end time (trailing edge) is designated by t_E, while the end time of the interference pulses, which in this example start before the rising edge of the useful signal pulse, is designated by t_0.

A corresponding output signal of a real reception mixer is illustrated as function of time in Fig. 1b, the same time axis being used as the basis as in Fig. 1a.

Fig. 2 shows, in order to illustrate a first embodiment of the present invention, an arrangement 100 composed of a mixer 101, an amplifier stage 102 connected downstream of the latter, a low-pass filter 103 connected downstream of the amplifier stage 102, a differentiator stage 104 connected downstream of the low-pass filter 103, a threshold value discriminator 105 connected downstream of the differentiator stage 104, and an offset compensation stage 106 which is arranged in parallel with the differentiator stage 104, downstream of the low-pass filter 103, and is controlled by an output signal of the threshold value discriminator 105. The offset compensation stage 106 includes (not illustrated individually in Fig. 2) an average value forming stage for the digital formation of average values and a subtraction stage for the subtraction of the averaged level values which are sensed before and after the end time t_0 (Fig. 1a) of the adjacent channel interference. The differentiator stage can be embodied in a manner known per se as an analog differentiator or as a digital differentiator stage implemented via either hardware or programmable signal processing within the scope of the DSP of a mobile telephone terminal.

In the event of a number of instances of interference being expected, a number of devices for storing the sensed times of the instances of interference and the corresponding level values are to be provided.

The arrangement shown is specifically advantageous in the case of long useful signal bursts which are superimposed by more than one short interference pulse, and are therefore relevant for the multislot operation according to the GSM standard.

Fig. 3 shows an arrangement 200 which is modified with respect to Fig. 2 and in which a mixer 201, an amplifier stage 202 which is connected downstream of the latter and an offset compensation stage 207 are also provided. A low-pass filter 203 is arranged here in a parallel processing branch, and a detector diode 204 for sensing the interference signal is connected downstream of the low-pass filter 203. A pulse shaper circuit 205 is connected downstream of the detector diode, and a time sensing stage 206, for sensing the time t_0 (Fig. 1a) is connected downstream of the pulse shaper circuit 205.

In this modification, the computational complexity, and thus the power consumption, can be reduced further in comparison with the embodiment shown in Fig. 2 and/or the accuracy of the determination of the end point or starting point of the interference signal can be increased as the result of the band limitation of the signal which is not a problem here.

In Fig. 4, an arrangement 300 (again in the form of a functional block circuit diagram) is outlined as a further embodiment in which, firstly, in a way similar to Fig. 3, the output of a mixer 301 is connected on the one hand to an amplifier stage 302 (not embodied in a controllable form here) and to a low-pass filter 303 on the other, as well as to a detector diode 304 which is connected downstream of the latter. In each case an A/D converter 305a, 305b is connected downstream both of the controllable amplifier 302 and of the detector diode 304. The output of the first A/D converter 305a is connected to a first input of an addition stage 306, and the output of the second A/D converter 305b is connected to a correction circuit 307 for correcting the detector characteristic line and the amplification with the gain factor A1 set at the amplifier 302. The output of the correction stage 307 is connected via an inverter 308 to å second input of the addition stage 306. Overall, this arrangement of the aforesaid components 306 to 308 functionally implements subtraction, from the composite

signal level, of the interference signal level which is corrected with respect to the detector characteristic curves of the detector diode 304, on the one hand, and with respect to amplification in the amplifier stage 302, on the other.

Fig. 5 shows as a block circuit diagram a further arrangement 400 composed of a reception mixer 401, a low-pass filter 402, a detector circuit 403 connected downstream of the latter and an analog correction circuit 404 for correcting the detector characteristic curve, in which the outputs of the reception mixer 401 and of the correction circuit 404 are each connected to the non-inverting input of two operational amplifiers 405a, 405b, whose outputs ultimately lead into an amplifier stage 406. Via the operational amplifiers 405a, 405b, an analog subtraction of the interference signal (again corrected with respect to the detector characteristic curve) from the composite signal is implemented, and the difference signal is finally amplified.

The arrangement shown last has, in particular, the advantage of increasing the dynamics because the interference signal has already been eliminated from the baseband by correction.

Although the present invention has been described with reference to specific embodiments, those of skill in the art will recognize that changes may be made thereto without departing from the spirit and scope of the invention as set forth in the hereafter appended claims.

ABSTRACT OF THE DISCLOSURE

Method and apparatus for correcting a useful signal falsification in the receiver part of a telecommunication transmission system as a result of adjacent channel interference which generates, in particular, a square wave interference pulse in the useful channel, the starting point or end point of the adjacent channel interference being determined in a first step and an offset correction being carried out in a second step using the information relating to the starting point or end point.

In the claims:

On page 9, cancel line 1, and substitute the following left-hand justified heading therefor:

CLAIMS:

Please cancel claims 1-13, without prejudice, and substitute the following claims therefor:

14. A method for correcting a useful signal falsification in a receiver part of a telecommunication transmission system, which operates according to one of a TDD method and a TDMA method, as a result of adjacent channel interference which generates a square wave interference pulse in a useful channel, a composite signal thus formed of the useful signal and the interference pulse, the method comprising the steps of:

determining, in a first step, one of a starting point and an end point of the adjacent channel interference; and

carrying out, in a second step, an offset correction using information relating to, respectively, one of the starting point and the end point.

15. A method for correcting a useful signal falsification in a receiver part of a telecommunication transmission system as claimed in claim 14, the method further comprising the steps of:

performing differentiation of the composite signal in a first substep, as part of the step of determining; and

carrying out threshold value discrimination of a first deviation with a predetermined threshold value in a second substep as part of the step of carrying out the offset correction.

16. A method for correcting a useful signal falsification in a receiver part of a telecommunication transmission system as claimed in claim 14, wherein the step of determining is effected via one of a detector element and a detector circuit, utilizing a frequency offset of the interference.

17. A method for correcting a useful signal falsification in a receiver part of a telecommunication transmission system as claimed in claim 14, wherein the offset

correction includes a digital average value formation of the composite signal up to or starting from one of the starting point and the end point of the interference, and a subsequent subtraction of the calculated average values.

18. A method for correcting a useful signal falsification in a receiver part of a telecommunication transmission system as claimed in claim 15, wherein interference signal energy is sensed during the detection of the source of interference and is subsequently subtracted from composite signal energy starting from the starting point or up to the end point of the interference.

19. A method for correcting a useful signal falsification in a receiver part of a telecommunication transmission system as claimed in claim 18, wherein the subtraction is carried out as a computational subtraction after digitization of the signal energy values.

20. A method for correcting a useful signal falsification in a receiver part of a telecommunication transmission system as claimed in claim 18, wherein the subtraction is carried out via an operational amplifier arrangement.

21. An apparatus for correcting a useful signal falsification in a receiver part of a telecommunication transmission system, which operates according to one of a TDD method and a TDMA method, as a result of adjacent channel interference which generates a square wave interference pulse in a useful channel, a composite signal thus formed of the useful signal and the interference pulse, the apparatus comprising:

sensing parts for determining one of a starting point and an end point of the adjacent channel interference; and

correction parts connected at an input end to the sensing parts to carry out an offset correction using information relating to, respectively, one of the starting point and the end point.

22. An apparatus for correcting a useful signal falsification in a receiver part of a telecommunication transmission system as claimed in claim 21, wherein the

sensing parts include a differentiator stage and a threshold value discriminator connected downstream of the differentiator stage.

23. An apparatus for correcting a useful signal falsification in a receiver part of a telecommunication transmission system as claimed in claim 21, wherein the sensing parts include an RF detector diode, and at least one of a correction shaper stage and a pulse shaper stage connected downstream of the RF detector diode.

24. An apparatus for correcting a useful signal falsification in a receiver part of a telecommunication transmission system as claimed in claim 21, wherein the correction parts include an A/D converter, a reference value memory and a digital subtraction stage.

25. An apparatus for correcting a useful signal falsification in a receiver part of a telecommunication transmission system as claimed in claim 24, wherein an average value forming stage is connected upstream of the reference value memory and the digital subtraction stage.

26. An apparatus for correcting a useful signal falsification in a receiver part of a telecommunication transmission system as claimed in claim 21, wherein the correction parts include an operational amplifier arrangement.

REMARKS

The present amendment makes editorial changes and corrects typographical errors in the specification, which includes the Abstract, in order to conform the specification to the requirements of United States Patent Practice. No new matter is added thereby. Attached hereto is a marked-up version of the changes made to the specification by the present amendment. The attached page is captioned "**Version With Markings To Show Changes Made**".

In addition, the present amendment cancels original claims 1-13 in favor of new claims 14-26. Claims 14-26 have been presented solely because the revisions by red-lining and underlining which would have been necessary in claims 1-16 in order to present those claims in accordance with preferred United States Patent Practice would have been too extensive, and thus would have been too burdensome. The present amendment is intended for clarification purposes only and not for substantial reasons related to patentability pursuant to 35 U.S.C. §§101, 102, 103 or 112. Indeed, the cancellation of claims 1-13 does not constitute an intent on the part of the Applicants to surrender any of the subject matter of claims 1-16.

Early consideration on the merits is respectfully requested.

Respectfully submitted,

(Reg. No. 39,056)

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Attorneys for Applicants

VERSIONS WITH MARKINGS TO SHOW CHANGES MADE

In The Specification:

The Specification of the present application, including the Abstract, has been amended as follows:

SPECIFICATION

TITLE OF THE INVENTION

METHOD AND ~~DEVICE~~ APPARATUS FOR CORRECTING A USEFUL SIGNAL FALSIFICATION

BACKGROUND OF THE INVENTION

The present invention relates to a method for correcting a useful signal falsification in the receiver part of a telecommunication transmission system which operates, in particular, according to the TDD or TDMA method, ~~as claimed in the preamble of claim 1,~~ and to a device for carrying out this method.

In mobile radio systems, multiple access methods or multiplex methods are absolutely necessary owing to the limited resources of the frequency spectrum in order to make possible subscriber numbers of orders of magnitude ranging from millions to hundreds of millions. The method of access of a ~~plurality~~ number of subscribers must be organized and the receiver parts must be embodied in such a way that an unacceptable interference of the transmission of information does not occur.

The frequency, time-division and code multiplex methods are known as basic multiple access methods, and all three methods are used in practice in mobile telephone networks. Specifically, time-division multiplex methods, which are implemented in practice as TDD (Time Division Duplex) or TDMA (Time Division Multiple Access) have become very widespread in digital mobile telephone networks, in which they are often combined with frequency-division multiplex methods (FDMA = Frequency Division Multiple Access) in such a way that a ~~plurality~~ number of carrier frequencies are provided. Thus, according to the GSM standard, carrier frequencies with 200 kHz spacing with respect to one another ~~in each case~~ are provided and a subdivision into eight time slots on each carrier frequency is predefined.

Time-division multiplex techniques are also being increasingly used for cordless telephones, a combination of FDMA and TDMA also being provided here. In

the European DECT standard for cordless telephones, up to ten frequency channels are used, which are each divided into twelve time slots for the uplink and downlink.

The receivers in TDD or TDMA systems can be built according to the direct conversion principle. In such receivers, adjacent channel sources of interference result in square wave interference owing to quadratic elements which are produced in the analog part of the receiver, in particular in the reception mixer, ~~said~~ the square wave interference bringing about an increase in the bit error rate during the customary digital modulation. In order to fulfill the stringent requirements in terms of the bit error rate which are made of system protocols, in particular of the GSM system, very high demands are made of the transmission qualities of the mixer, which demands cannot currently be fulfilled with established circuit technologies.

For this reason, it has been proposed to correct the aforesaid interference subsequently ~~by means of~~ via iterative, computational determination of the change in the signal amplitude (offset) associated with ~~said~~ the interference, ~~by means of~~ via a correction device which is connected downstream of the mixer. However, this entails a high degree of computational complexity and a correspondingly increased level of current consumption~~,~~ and, therefore, reduces the possible maximum call duration which constitutes an essential performance parameter of any mobile telephone.

The present invention is, therefore ~~based on the object of disclosing.~~ directed toward an improved method of the genus-forming type, which avoids computational complexity and saves current, as well as ~~a device~~ an apparatus for carrying out this method.

~~This object is achieved in terms of its method aspect by a method having the features of claim 1, and in terms of its device aspect by means of a device having the features of claim 8.~~

SUMMARY OF THE INVENTION

The present invention includes the essential idea of firstly determining the time when interference starts and subsequently, ~~by means of~~ via this knowledge, carrying out a correction process in a way that is less complex~~,~~ and, thus, saves current with regard to the calculation processes. By applying an analog correction method, there is virtually no added computational complexity (in the narrowest sense) here.

In one preferred embodiment, ~~firstly~~ differentiation of the composite signal and ~~subsequently~~ then threshold value discrimination of the first deviation is carried out with a predetermined threshold value in order to determine the time when the interference starts. This threshold value corresponds to the maximum possible steepness of the useful signal, multiplied by a suitably selected safety factor in order to avoid incorrect detection. Both the formation of the first deviation of the composite signal and its comparison with the aforesaid threshold value constitute routine operations which can be implemented readily, and with relatively low power consumption, using integrated circuit technology and/or ~~by means of~~ via suitable software – within the framework of complex digital signal processing (DSP) which is implemented in any case.

However, as an alternative, it is also possible to provide, for the determination of the point in time when interference starts, a specific detector element (for example, a detector diode) or a circuit with a corresponding function (for example, what is referred to as an RSSI circuit) which utilizes, in particular, the frequency offset of the source of interference with respect to the carrier signal.

The actual correction process which is carried out using the information relating to the time when the interference starts can be configured as a calculation process on the basis of digitized values of the signal amplitude~~,~~ or, alternatively ~~also~~, as an analog "subtraction."

In the former case, in particular a (digital) average value formation of the composite signal is carried out in the period between the rising edge of the useful signal up to the starting time of the interference on the one hand, and in the period from the starting time of the interference up to the trailing edge of the useful signal on the other hand, and the two calculated average values are subsequently subtracted. It is also possible to determine the interference signal energy during the detection of the source of interference and to subtract it from the composite signal energy starting from the time when the interference starts. In this later case, subtraction is also possible in the sense of a genuine calculation after the corresponding energy values have been digitized.

In ~~a device~~ an apparatus for carrying out the method according to the present invention, - corresponding to the above-mentioned characterization of the method

according to the present invention, - sensing parts for determining the time when the interference starts and correction ~~means~~ parts which are connected at the input end to these sensing ~~means~~ parts in order to carry out the offset correction are provided. Reference has already been made above to embodiment possibilities for the sensing ~~means~~ parts. If a detector element or a detector circuit is used, in particular a correction stage for taking into account the detector characteristic curve for the output signal shape and/or a pulse shaper stage is connected downstream of it. In an analog embodiment, the actual correction ~~means~~ parts can have an analog subtraction device; in the case of a digital calculation of the absolute offset value or correction value, a reference value memory and a digital subtraction stage, and in particular an average value calculation stage connected upstream of these units, are provided.

~~Advantages and expedient features of the invention emerge, for the rest, from the subclaims and/or the following description of preferred exemplary embodiments with reference to the figures.~~

Additional features and advantages of the present invention are described in, and will be apparent from, the following Detailed Description of the Invention and the Figures.

BRIEF DESCRIPTION OF THE FIGURES

~~f~~Figs 1a and 1b are exemplary views of the time-dependence of the useful signal and interference signal and/or of a composite signal of a real mixer in a direct conversion receiver.

~~f~~Fig. 2 is a schematic view of a first embodiment in the form of a block diagram.

~~f~~Fig. 3 is a schematic view of a second embodiment in the form of a block diagram.

~~f~~Fig. 4 is a schematic view of a third embodiment in the form of a block diagram.

~~f~~Fig. 5 is a schematic view of a fourth embodiment in the form of a block diagram.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 1a shows the time profile of a useful signal with a carrier frequency f1 and a level P1, and in a separate illustration the time profile of an interference signal with a

carrier frequency f2 and a level P2, such as would occur in an ideal reception mixer. The starting time (the rising edge) of a useful signal pulse is designated by t_A, and its end time (trailing edge) is designated by t_E, while the end time of the interference pulses, which in this example start before the rising edge of the useful signal pulse, is designated by t_0.

A corresponding output signal of a real reception mixer is illustrated as function of time in ~~f~~Fig. 1b, the same time axis being used as the basis as in ~~f~~Fig. 1a.

Fig. 2 shows, in order to illustrate a first embodiment of the present invention, an arrangement 100 composed of a mixer 101, an amplifier stage 102 connected downstream of the latter, a low-pass filter 103 connected downstream of ~~said~~ the amplifier stage 102, a differentiator stage 104 connected downstream of ~~said~~ the low-pass filter 103, a threshold value discriminator 105 connected downstream of ~~said~~ the differentiator stage 104, and an offset compensation stage 106 which is arranged in parallel with the differentiator stage 104, downstream of the low-pass filter 103, and is controlled by an output signal of the threshold value discriminator 105. The offset compensation stage 106 ~~comprises~~ includes (not illustrated individually in ~~the figure~~) Fig. 2) an average value forming stage for the digital formation of average values and a subtraction stage for the subtraction of the averaged level values which are sensed before and after the end time t_0 (~~f~~Fig. 1a) of the adjacent channel interference. The differentiator stage can be embodied in a manner known per se as an analog differentiator or as a digital differentiator stage implemented ~~by means of~~ via either hardware~~,~~ or ~~by means of~~ programmable signal processing within the scope of the DSP of a mobile telephone terminal.

In the event of a ~~plurality~~ number of instances of interference being expected, a ~~plurality~~ number of devices for storing the sensed times of the instances of interference and the corresponding level values are to be provided.

The arrangement shown is specifically advantageous in the case of long useful signal bursts which are superimposed by more than one short interference pulse, and are therefore relevant for the multislot operation according to the GSM standard.

Fig. 3 shows an arrangement 200 which is modified with respect to ~~the f~~Fig. 2 and in which a mixer 201, an amplifier stage 202 which is connected downstream of the latter and an offset compensation stage 207 are also provided. A low-pass filter

203 is arranged here in a parallel processing branch, and a detector diode 204 for sensing the interference signal is connected downstream of ~~said~~ the low-pass filter 203. A pulse shaper circuit 205 is connected downstream of the detector diode, and a time sensing stage 206, for sensing the time t_0 (~~f~~Fig. 1a) is connected downstream of ~~said~~ the pulse shaper circuit 205.

In this modification, the computational complexity, and thus the power consumption, can be reduced further in comparison with the embodiment shown in ~~f~~Fig. 2 and/or the accuracy of the determination of the end point or starting point of the interference signal can be increased as the result of the band limitation of the signal which is not a problem here.

In ~~f~~Fig. 4, an arrangement 300 - (again in the form of a functional block circuit diagram) - is outlined as a further embodiment, in which, firstly, in a way similar to ~~f~~Fig. 3, the output of a mixer 301 is connected on the one hand to an amplifier stage 302 (not embodied in a controllable form here) and to a low-pass filter 303 on the other, as well as to a detector diode 304 which is connected downstream of the latter. In each case an A/D converter 305a, 305b is connected downstream both of the controllable amplifier 302 and of the detector diode 304. The output of the first A/D converter 305a is connected to a first input of an addition stage 306, and the output of the second A/D converter 305b is connected to a correction circuit 307 for correcting the detector characteristic line and the amplification with the gain factor A1 set at the amplifier 302. The output of the correction stage 307 is connected via an inverter 308 to a second input of the addition stage 306. Overall, this arrangement of the aforesaid components 306 to 308 functionally implements subtraction, from the composite signal level, of the interference signal level which is corrected with respect to the detector characteristic curves of the detector diode 304, on the one hand, and with respect to ~~the~~ amplification ~~of the [lacuna]~~ in the amplifier stage 302, on the other.

Fig. 5 shows as a block circuit diagram a further arrangement 400 composed of a reception mixer 401, a low-pass filter 402, a detector circuit 403 connected downstream of the latter and an analog correction circuit 404 for correcting the detector characteristic curve, in which the outputs of the reception mixer 401 and of the correction circuit 404 are each connected to the non-inverting input of two operational amplifiers 405a, 405b, whose outputs ultimately lead into an amplifier

stage 406. ~~By means of~~ Via the operational amplifiers 405a, 405b, an analog subtraction of the interference signal (again corrected with respect to the detector characteristic curve) from the composite signal is implemented, and the difference signal is finally amplified.

The arrangement shown last has, in particular, the advantage of increasing the dynamics because the interference signal has already been eliminated from the baseband by correction.

~~The execution of the invention is not restricted to the examples described here but is also possible in a multiplicity of modifications which a person skilled in the art can readily deduce from the above explanations.~~

Although the present invention has been described with reference to specific embodiments, those of skill in the art will recognize that changes may be made thereto without departing from the spirit and scope of the invention as set forth in the hereafter appended claims.

ABSTRACT OF THE DISCLOSURE

Method and apparatus for correcting a useful signal falsification in the receiver part ~~(100; 200; 300; 400)~~ of a telecommunication transmission system as a result of adjacent channel interference which generates ~~an~~, in particular, a square wave interference pulse in the useful channel, the starting point or end point of the adjacent channel interference being determined in a first step and an offset correction being carried out in a second step using the information relating to the starting point or end point.

Description

Method and device for correcting a useful signal falsification

The invention relates to a method for correcting a useful signal falsification in the receiver part of a telecommunication transmission system which operates in particular according to the TDD or TDMA method, as claimed in the preamble of claim 1, and a device for carrying out this method.

In mobile radio systems, multiple access methods or multiplex methods are absolutely necessary owing to the limited resources of the frequency spectrum in order to make possible subscriber numbers of orders of magnitude ranging from millions to hundreds of millions. The method of access of a plurality of subscribers must be organized and the receiver parts must be embodied in such a way that an unacceptable interference of the transmission of information does not occur.

The frequency, time-division and code multiplex methods are known as basic multiple access methods, and all three methods are used in practice in mobile telephone networks. Specifically, time-division multiplex methods, which are implemented in practice as TDD (Time Division Duplex) or TDMA (Time Division Multiple Access) have become very widespread in digital mobile telephone networks, in which they are often combined with frequency-division multiplex methods (FDMA = Frequency Division Multiple Access) in such a way that a plurality of carrier frequencies are provided. Thus, according to the GSM standard carrier frequencies with 200 kHz spacing with respect to one another in each case are provided and a subdivision into eight time slots on each carrier frequency is predefined.

Time-division multiplex techniques are also being increasingly used for cordless telephones, a combination of FDMA and TDMA also being provided here. In the European DECT standard

for cordless telephones, up to ten frequency channels are used, which are each divided into twelve time slots for the uplink and downlink.

The receivers in TDD or TDMA systems can be built according to the direct conversion principle. In such receivers, adjacent channel sources of interference result in square wave interference owing to quadratic elements which are produced in the analog part of the receiver, in particular in the reception mixer, said square wave interference bringing about an increase in the bit error rate during the customary digital modulation. In order to fulfill the stringent requirements in terms of the bit error rate which are made of system protocols, in particular of the GSM system, very high demands are made of the transmission qualities of the mixer, which demands cannot currently be fulfilled with established circuit technologies.

For this reason, it has been proposed to correct the aforesaid interference subsequently by means of iterative, computational determination of the change in the signal amplitude (offset) associated with said interference, by means of a correction device which is connected downstream of the mixer. However, this entails a high degree of computational complexity and a correspondingly increased level of current consumption, and therefore reduces the possible maximum call duration which constitutes an essential performance parameter of any mobile telephone.

The invention is therefore based on the object of disclosing an improved method of the genus-forming type, which avoids computational complexity and saves current, as well as a device for carrying out this method.

This object is achieved in terms of its method aspect by a method having the features of claim 1, and in terms of its device aspect by means of a device having the features of claim 8.

The invention includes the essential idea of firstly determining the time when interference starts and subsequently, by means of this knowledge, carrying out a correction process in a way that is less complex, and thus saves current with regard to the calculation processes. By applying an analog correction method, there is virtually no added computational complexity (in the narrowest sense) here.

In one preferred embodiment, firstly differentiation of the composite signal and subsequently threshold value discrimination of the first deviation is carried out with a predetermined threshold value in order to determine the time when the interference starts. This threshold value corresponds to the maximum possible steepness of the useful signal, multiplied by a suitably selected safety factor in order to avoid incorrect detection. Both the formation of the first deviation of the composite signal and its comparison with the aforesaid threshold value constitute routine operations which can be implemented readily, and with relatively low power consumption, using integrated circuit technology and/or by means of suitable software - within the framework of complex digital signal processing (DSP) which is implemented in any case.

However, as an alternative, it is also possible to provide, for the determination of the point in time when interference starts, a specific detector element (for example a detector diode) or a circuit with a corresponding function (for example what is referred to as an RSSI circuit) which utilizes in particular the frequency offset of the source of interference with respect to the carrier signal.

The actual correction process which is carried out using the information relating to the time when the

interference starts can be configured as a calculation process on the basis of digitized values of the signal amplitude, or alternatively also as an analog "subtraction".

In the former case, in particular a (digital) average value formation of the composite signal is carried out in the period between the rising edge of the useful signal up to the starting time of the interference on the one hand, and in the period from the starting time of the interference up to the trailing edge of the useful signal on the other hand, and the two calculated average values are subsequently subtracted. It is also possible to determine the interference signal energy during the detection of the source of interference and to subtract it from the composite signal energy starting from the time when the interference starts. In this later case, subtraction is also possible in the sense of a genuine calculation after the corresponding energy values have been digitized.

In a device for carrying out the method according to the invention - corresponding to the abovementioned characterization of the method according to the invention - sensing means for determining the time when the interference starts and correction means which are connected at the input end to these sensing means in order to carry out the offset correction are provided. Reference has already been made above to embodiment possibilities for the sensing means. If a detector element or a detector circuit is used, in particular a correction stage for taking into account the detector characteristic curve for the output signal shape and/or a pulse shaper stage is connected downstream of it. In an analog embodiment, the actual correction means can have an analog subtraction device; in the case of a digital calculation of the absolute offset value or correction value, a reference value memory and a digital subtraction stage, and in particular an average value calculation stage connected upstream of these units, are provided.

Advantages and expedient features of the invention emerge, for the rest, from the subclaims and/or the following description of preferred exemplary embodiments with reference to the figures. In the drawing:

figs 1a and 1b are exemplary views of the time-dependence of the useful signal and interference signal and/or of a composite signal of a real mixer in a direct conversion receiver,

fig. 2 is a schematic view of a first embodiment in the form of a block diagram,

fig. 3 is a schematic view of a second embodiment in the form of a block diagram,

fig. 4 is a schematic view of a third embodiment in the form of a block diagram, and

fig. 5 is a schematic view of a fourth embodiment in the form of a block diagram.

Fig. 1a shows the time profile of a useful signal with a carrier frequency f1 and a level P1, and in a separate illustration the time profile of an interference signal with a carrier frequency f2 and a level P2, such as would occur in an ideal reception mixer. The starting time (the rising edge) of a useful signal pulse is designated by t_A, and its end time (trailing edge) is designated by t_E, while the end time of the interference pulses - which in this example start before the rising edge of the useful signal pulse - is designated by t_0.

A corresponding output signal of a real reception mixer is illustrated as function of time in fig. 1b, the same time axis being used as the basis as in fig. 1a.

Fig. 2 shows, in order to illustrate a first embodiment of the invention, an arrangement 100 composed of a mixer 101, an amplifier stage 102

connected downstream of the latter, a low-pass filter 103 connected downstream of said amplifier stage 102, a

differentiator stage 104 connected downstream of said low-pass filter 103, a threshold value discriminator 105 connected downstream of said differentiator stage 104, and an offset compensation stage 106 which is arranged in parallel with the differentiator stage 104, downstream of the low-pass filter 103, and is controlled by an output signal of the threshold value discriminator 105. The offset compensation stage 106 comprises (not illustrated individually in the figure) an average value forming stage for the digital formation of average values and a subtraction stage for the subtraction of the averaged level values which are sensed before and after the end time t_0 (fig. 1a) of the adjacent channel interference. The differentiator stage can be embodied in a manner known per se as an analog differentiator or as a digital differentiator stage implemented by means of hardware, or by means of programmable signal processing within the scope of the DSP of a mobile telephone terminal.

In the event of a plurality of instances of interference being expected, a plurality of devices for storing the sensed times of the instances of interference and the corresponding level values are to be provided.

The arrangement shown is specifically advantageous in the case of long useful signal bursts which are superimposed by more than one short interference pulse, and are therefore relevant for the multislot operation according to the GSM standard.

Fig. 3 shows an arrangement 200 which is modified with respect to the fig. 2 and in which a mixer 201, an amplifier stage 202 which is connected downstream of the latter and an offset compensation stage 207 are also provided. A low-pass filter 203 is arranged here in a parallel processing branch, and a detector diode

204 for sensing the interference signal is connected downstream of said low-pass filter 203. A pulse shaper circuit 205 is connected downstream of the detector diode, and a time sensing stage 206, for sensing the time t_0 (fig. 1a) is connected downstream of said pulse shaper circuit 205.

In this modification, the computational complexity, and thus the power consumption, can be reduced further in comparison with the embodiment shown in fig. 2

and/or the accuracy of the determination of the end point or starting point of the interference signal can be increased as the result of the band limitation of the signal which is not a problem here.

In fig. 4, an arrangement 300 - again in the form of a functional block circuit diagram - is outlined as a further embodiment, in which firstly, in a way similar to fig. 3, the output of a mixer 301 is connected on the one hand to an amplifier stage 302 (not embodied in a controllable form here) and to a low-pass filter 303 on the other, as well as to a detector diode 304 which is connected downstream of the latter. In each case an A/D converter 305a, 305b is connected downstream both of the controllable amplifier 302 and of the detector diode 304. The output of the first A/D converter 305a is connected to a first input of an addition stage 306, and the output of the second A/D converter 305b is connected to a correction circuit 307 for correcting the detector characteristic line and the amplification with the gain factor A1 set at the amplifier 302. The output of the correction stage 307 is connected via an inverter 308 to a second input of the addition stage 306. Overall, this arrangement of the aforesaid components 306 to 308 functionally implements subtraction, from the composite signal level, of the interference signal level which is corrected with respect to the detector characteristic curves of the detector diode 304, on the one hand, and with respect to the amplification of the [lacuna] in the amplifier stage 302, on the other.

Fig. 5 shows as a block circuit diagram a further arrangement 400 composed of a reception mixer 401, a low-pass filter 402, a detector circuit 403 connected downstream of the latter and an analog correction circuit 404 for correcting the detector characteristic curve, in which the outputs of the reception mixer 401

and of the correction circuit 404 are each connected to the non-inverting input of two operational amplifiers 405a, 405b, whose outputs ultimately lead into an amplifier stage 406. By means of the operational amplifiers 405a, 405b, an analog subtraction of the interference signal (again corrected with respect to the

detector characteristic curve) from the composite signal is implemented, and the difference signal is finally amplified.

The arrangement shown last has, in particular, the advantage of increasing the dynamics because the interference signal has already been eliminated from the baseband by correction.

The execution of the invention is not restricted to the examples described here but is also possible in a multiplicity of modifications which a person skilled in the art can readily deduce from the above explanations.

Patent claims

1. A method for correcting a useful signal falsification in the receiver part (100; 200; 300; 400) of a telecommunication transmission system which operates in particular according to the TDD or TDMA method as a result of adjacent channel interference which generates an, in particular, square wave interference pulse in the useful channel, characterized in that the starting point or end point of the adjacent channel interference is determined in a first step and an offset correction is carried out in a second step using the information relating to the starting point or end point.

2. The method as claimed in claim 1, characterized in that, in order to determine the starting point or end point of the adjacent channel interference, differentiation (104) of the composite signal is performed in a first substep, and threshold value discrimination (105) of the first deviation with a predetermined threshold value is carried out in a second substep.

3. The method as claimed in claim 1, characterized in that the starting point or end point of the adjacent channel interference is determined by means of a detector element or a detector circuit (204; 304; 403), in particular utilizing the frequency offset of the interference.

4. The method as claimed in one of the preceding claims, characterized in that the offset correction comprises a digital average value formation of the composite signal up to or starting from the starting point or end point of the interference, and a subsequent subtraction

(306) of the calculated average values.

5. The method as claimed in claim 2 or 3, characterized in that

the interference signal energy is sensed during the detection of the source of interference and subsequently subtracted from the composite signal energy starting from the starting point or up to the end point of the interference.

6. The method as claimed in claim 5, characterized in that the subtraction is carried out as a computational subtraction (306) after digitization of the signal energy values.

7. The method as claimed in claim 5, characterized in that the subtraction is carried out in an analogous fashion, in particular by means of an operational amplifier arrangement (405a, 405b).

8. A device (100; 200; 300; 400) for carrying out the method as claimed in one of the preceding claims, characterized by sensing means for determining the starting point or end point of the adjacent channel interference, and correction means (106; 207; 306; 405a, 405b) which are connected at the input end to the sensing means in order to carry out the offset correction.

9. The device as claimed in claim 8, characterized in that the sensing means have a differentiator stage (104) and a threshold value discriminator (105) connected downstream of said differentiator stage 104.

10. The method as claimed in claim 8, characterized in that the sensing means have a detector element (204; 304; 403), in particular a RF detector diode, and a correction shaper stage and/or pulse shaper stage (205; 307; 404) which is connected downstream of the latter.

11. The device as claimed in one of claims 8 to 10, characterized in that the correction means have an A/D converter (305a; 305b), a reference value memory and a digital subtraction stage (306, 308).

12. The device as claimed in claim 11, characterized in that an average value forming stage is connected upstream of the reference value memory and the digital subtraction stage.

13. The device as claimed in one of claims 8 to 10, characterized in that the correction means have an analog subtraction device, in particular an operational amplifier arrangement (405a, 405b).

GR 99 P 2276

Abstract

Method and device for correcting a useful signal falsification

Method for correcting a useful signal falsification in the receiver part (100; 200; 300; 400) of a telecommunication transmission system as a result of adjacent channel interference which generates an, in particular, square wave interference pulse in the useful channel, the starting point or end point of the adjacent channel interference being determined in a first step and an offset correction being carried out in a second step using the information relating to the starting point or end point.

(Fig. 2)

FIG 1A

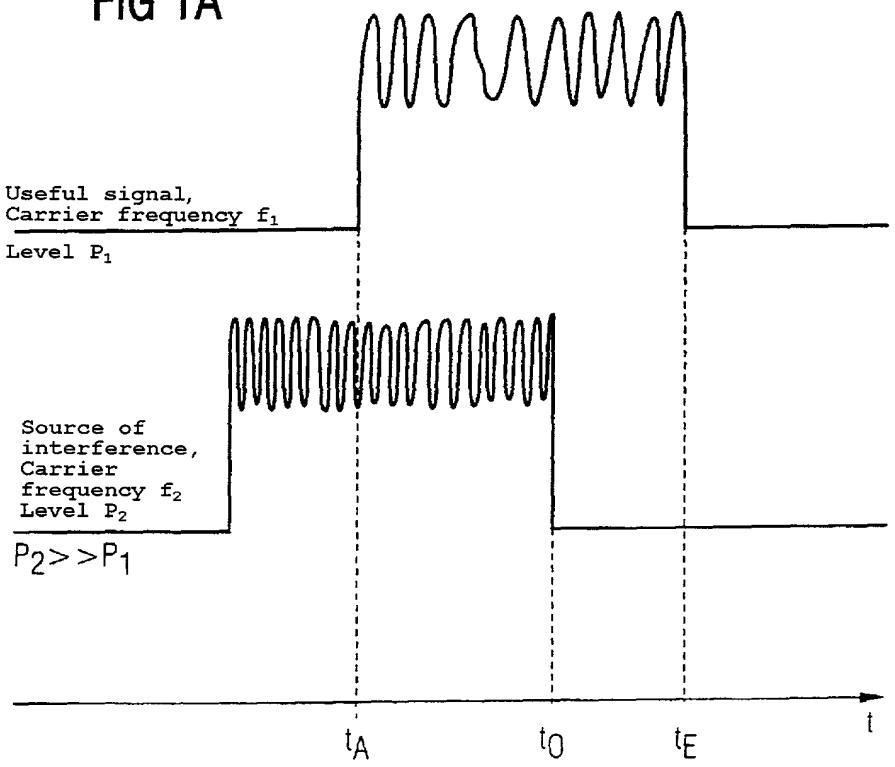
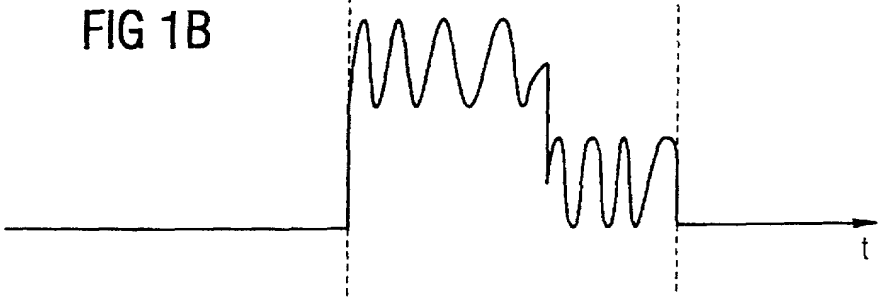


FIG 1B



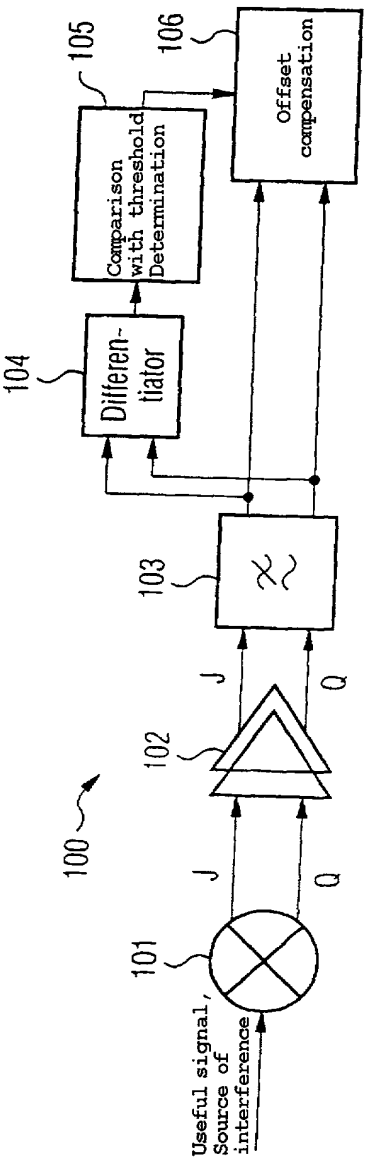


FIG 2

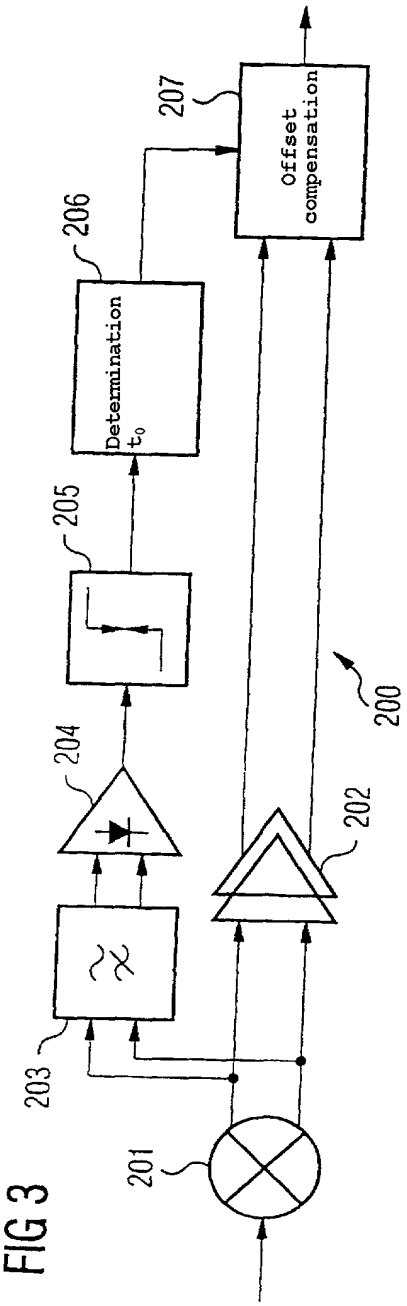


FIG 3

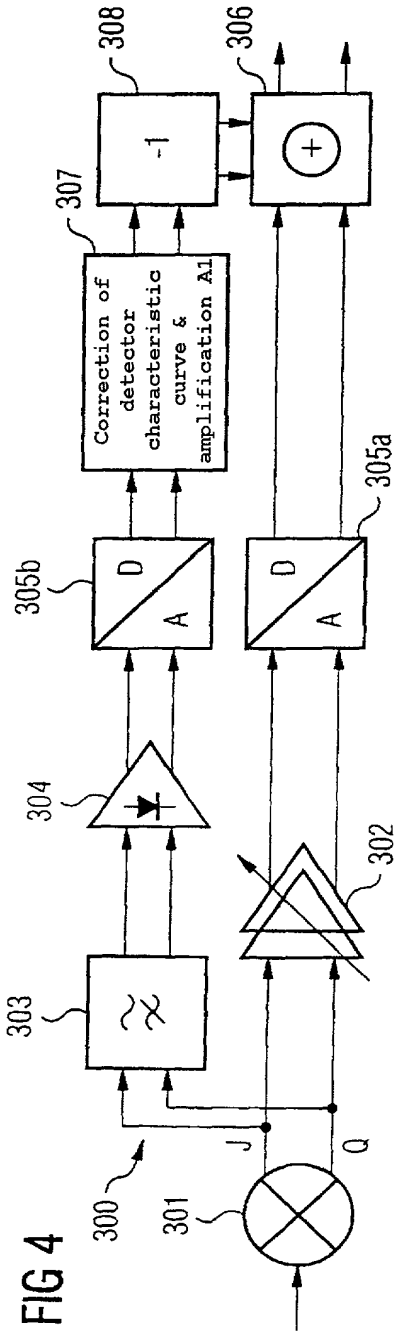

308
306
307
-1
+
Correction of detector characteristic curve & amplification A1
305b
305a
D
A
304
302
303
300
301
J
Q

FIG 4

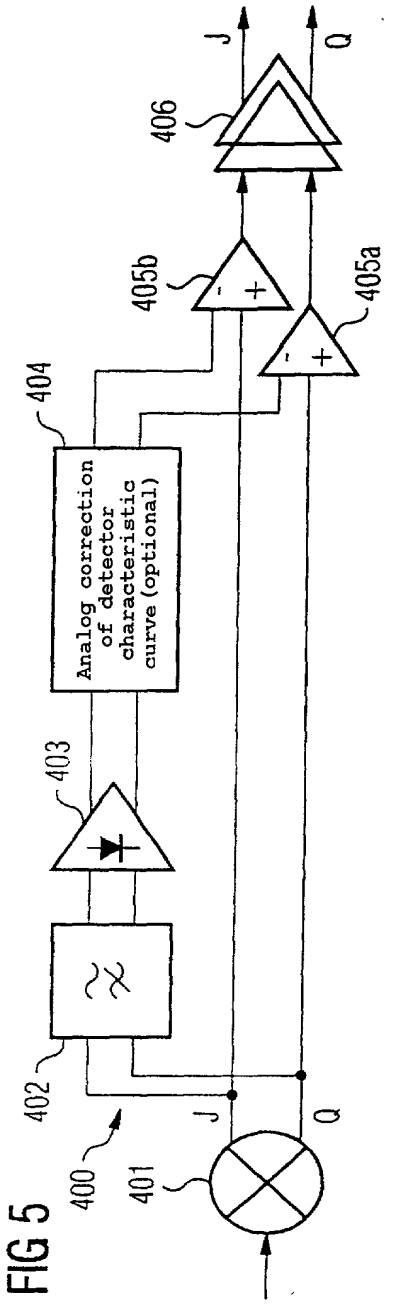

406
J
Q
405b
405a
404
Analog correction of detector characteristic curve (optional)
403
402
400
401
J
Q

FIG 5

Declaration and Power of Attorney For Patent Application

Erklärung Für Patentanmeldungen Mit Vollmacht

German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

As a below named inventor, I hereby declare that:

dass mein Wohnsitz, meine Postanschrift, und meine Staatsangehörigkeit den im Nachstehenden nach meinem Namen aufgeführten Angaben entsprechen,

My residence, post office address and citizenship are as stated below next to my name,

dass ich, nach bestem Wissen der ursprüngliche, erste und alleinige Erfinder (falls nachstehend nur ein Name angegeben ist) oder ein ursprünglicher, erster und Miterfinder (falls nachstehend mehrere Namen aufgeführt sind) des Gegenstandes bin, für den dieser Antrag gestellt wird und für den ein Patent beantragt wird für die Erfindung mit dem Titel:

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Verfahren und Vorrichtung zur Korrektur einer Nutzsignalverfälschung

Method and device for correcting a corrupted useful signal

deren Beschreibung

(zutreffendes ankreuzen)
☐ hier beigefügt ist.
☒ am 12.05.2000 als
PCT internationale Anmeldung
PCT Anmeldungsnummer PCT/DE00/01491
eingereicht wurde und am _______
abgeändert wurde (falls tatsächlich abgeändert).

the specification of which

(check one)
☐ is attached hereto.
☒ was filed on 12.05.2000 as
PCT international application
PCT Application No. PCT/DE00/01491
and was amended on __________
(if applicable)

Ich bestätige hiermit, dass ich den Inhalt der obigen Patentanmeldung einschliesslich der Ansprüche durchgesehen und verstanden habe, die eventuell durch einen Zusatzantrag wie oben erwähnt abgeändert wurde.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment referred to above.

Ich erkenne meine Pflicht zur Offenbarung irgendwelcher Informationen, die für die Prüfung der vorliegenden Anmeldung in Einklang mit Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) von Wichtigkeit sind, an.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

Ich beanspruche hiermit ausländische Prioritätsvorteile gemäss Abschnitt 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 119 aller unten angegebenen Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde, und habe auch alle Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde nachstehend gekennzeichnet, die ein Anmeldedatum haben, das vor dem Anmeldedatum der Anmeldung liegt, für die Priorität beansprucht wird.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

German Language Declaration

Prior foreign appplications
Priorität beansprucht

			Priority Claimed	
19931312.1	DE	07.07.1999	☒	☐
(Number)	(Country)	(Day Month Year Filed)	Yes	No
(Nummer)	(Land)	(Tag Monat Jahr eingereicht)	Ja	Nein
			☐	☐
(Number)	(Country)	(Day Month Year Filed)	Yes	No
(Nummer)	(Land)	(Tag Monat Jahr eingereicht)	Ja	Nein
			☐	☐
(Number)	(Country)	(Day Month Year Filed)	Yes	No
(Nummer)	(Land)	(Tag Monat Jahr eingereicht)	Ja	Nein

Ich beanspruche hiermit gemäss Absatz 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 120, den Vorzug aller unten aufgeführten Anmeldungen und falls der Gegenstand aus jedem Anspruch dieser Anmeldung nicht in einer früheren amerikanischen Patentanmeldung laut dem ersten Paragraphen des Absatzes 35 der Zivilprozeßordnung der Vereinigten Staaten, Paragraph 122 offenbart ist, erkenne ich gemäss Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) meine Pflicht zur Offenbarung von Informationen an, die zwischen dem Anmeldedatum der früheren Anmeldung und dem nationalen oder PCT internationalen Anmeldedatum dieser Anmeldung bekannt geworden sind.

I hereby claim the benefit under Title 35. United States Code. §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §122, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occured between the filing date of the prior application and the national or PCT international filing date of this application.

PCT/DE00/01491	12.05.2000	anhängig	pending
(Application Serial No.) (Anmeldeseriennummer)	(Filing Date D, M, Y) (Anmeldedatum T, M, J)	(Status) (patentiert, anhängig, aufgegeben)	(Status) (patented, pending, abandoned)
(Application Serial No.) (Anmeldeseriennummer)	(Filing Date D,M,Y) (Anmeldedatum T, M; J)	(Status) (patentiert, anhängig, aufgeben)	(Status) (patented, pending, abandoned)

Ich erkläre hiermit, dass alle von mir in der vorliegenden Erklärung gemachten Angaben nach meinem besten Wissen und Gewissen der vollen Wahrheit entsprechen, und dass ich diese eidesstattliche Erklärung in Kenntnis dessen abgebe, dass wissentlich und vorsätzlich falsche Angaben gemäss Paragraph 1001, Absatz 18 der Zivilprozessordnung der Vereinigten Staaten von Amerika mit Geldstrafe belegt und/oder Gefängnis bestraft werden koennen, und dass derartig wissentlich und vorsätzlich falsche Angaben die Gültigkeit der vorliegenden Patentanmeldung oder eines darauf erteilten Patentes gefährden können.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

German Language Declaration

VERTRETUNGSVOLLMACHT: Als benannter Erfinder beauftrage ich hiermit den nachstehend benannten Patentanwalt (oder die nachstehend benannten Patentanwälte) und/oder Patent-Agenten mit der Verfolgung der vorliegenden Patentanmeldung sowie mit der Abwicklung aller damit verbundenen Geschäfte vor dem Patent- und Warenzeichenamt: *(Name und Registrationsnummer anführen)*

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*

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